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**DETAILED DESCRIPTION**

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**[Detailed Description of the Invention]****[0001]**

[Industrial Application] This invention relates to the circuit board for carrying electrical parts, such as light emitting diode (it being called Following LED), a lamp, and a resistance element, on the matrix circuit board by which mutual mesh-like solid wiring was carried out, for example, the matrix circuit board for connection with components used for the module for an LED display.

**[0002]**

[Description of the Prior Art] In this kind of matrix circuit board, the electrode pattern which consists of an anode, the cathode side wiring 4 (henceforth wiring 4) and a cathode, or anode side wiring 5 (henceforth wiring 5) is formed in the table of an insulating substrate 12, and hidden both sides as shown in drawing 4. It connects with the surface current carrying part 10 which separated in the surface electrode 9 of the electrode which considered wiring 4 formed in the rear-face side of an insulating substrate 12 as wiring 5 by the front-face side of an insulating substrate 12 through the through hole 11, and was formed. Thus, the circuit is formed by connecting the electrical parts 6, for example, an LED bare chip, such as diode and a resistance element, to the surface electrode 9 and the surface current carrying part 10 which were formed.

**[0003]**

[Problem(s) to be Solved by the Invention] However, by the configuration approach of this kind of matrix circuit, since wiring used as the current carrying part on a flat surface crossed, the through hole needed to be used or jumpering chip or solid wiring by the printed conductor needed to be performed, there was a problem in the dependability of that a process becomes complicated or connection etc. moreover -- since it is usually 18 micrometers or 35 micrometers as thickness of the conductor used as a circuit -- a conductor -- if resistance is strong and the circuit as a conductor becomes long, inclination will arise in supply voltage by the voltage drop, and problems, like as a result in light emitting diode, a difference appears in brightness become easy to arise.

[0004] since a glass fiber content epoxy resin substrate with mainly bad thermal conductivity is furthermore used as an insulating material as the circuit board for through holes -- a conductor -- there was a trouble which malfunction on a circuit etc. generates that it is easy to accumulate generation of heat from electrical parts, such as a circuit, carried diode, and a resistance element. Moreover, when the matrix circuit board in which LED was carried, without using a through hole is produced and it is going to connect these two or more matrix substrates, there is a trouble that dot pitch spacing of LED will become large on the boundary during connection.

**[0005]**

[Means for Solving the Problem] As a result of examining many things as an approach for solving these problems, this invention by carrying out solid wiring to the shape of a mesh various in the condition that the metallic conductor line was insulated beforehand A circuit is formed on one [ at least ] flat surface. To this field LED, diode, Electrical parts, such as a lamp and a resistance element, can be made to carry. As the contact pin and leadframe for connecting without changing the mother board for making the above, for example, LED, turn on furthermore, the circuit for in addition to this making an electrical part drive, or the dot pitch of other matrix circuit boards for an LED display, and LED It came to complete header this invention for the ability of the terminal for \*\*\*\*\*, or other connection fixtures to be prepared easily.

[0006] This invention carries out mutual mesh-like solid wiring at least, where 1. metallic conductor line is insulated beforehand, it removes a desired insulating part, carries an electrical part in one field of the matrix circuit board to which it makes it come to expose a metallic conductor line, and connects it with said metallic conductor line. To the field of another side further Namely, a contact pin, Prepare what was chosen from the group of a leadframe and a flexible substrate, and it connects with said metallic conductor line. Where the becoming matrix circuit board for connection with components and 2. metallic conductor line are insulated beforehand, carry out mutual mesh-like solid wiring at least, remove a desired insulating part, carry an electrical part in the matrix circuit board to which it makes it come to expose a metallic conductor line, and said metallic conductor line is connected. The leadframe or flexible substrate which may furthermore carry an electrical part in the same side is formed, and it is characterized by the matrix circuit board for connection with components which comes to connect with said metallic conductor line.

**[0007]**

[Function and Example(s)] A drawing explains this invention to a detail below. (1) of drawing 1 is the perspective view of

the plain-weave mesh-like solid wiring 2 which wove by turns the pre-insulation metallic conductor line 1 covered with the insulating material of this invention as warp and the weft, and (2) is a top view showing wiring 4 and wiring 5 in drawing 2 which consists of a pre-insulation metallic conductor line 1 exposed when the plain-weave mesh-like solid wiring 2 is seen at a flat surface.

[0008] Moreover, drawing 2 sinks in by the insulating agent 3, and uses the clearance between the plain-weave mesh-like solid wiring 2 as the circuit board 16. When it sees to the shape of a mesh at the flat surface of the pre-insulation metallic conductor line 1 by which solid wiring was carried out, as an electrical part to wiring 4 and wiring 5 which are exposed to a front face LED, Grind the insulating part in which diode, a lamp, a resistance element, etc. are carried (henceforth an electrical part), and a metallic conductor line is exposed. It is the side-face sectional view of the bonding pad 8 which connected the monochrome light emitting diode bare chip 6 to wiring 4 through solder, and was prepared in wiring 5, and the plotting board connected with the wire 7.

[0009] Although there is no limit in any way as the quality of the material if it is an object with small electric resistance as a metallic conductor line used for the pre-insulation metallic conductor line 1 of this invention, copper wire is suitable from the point of electric resistance and a price. And although there is especially no limit as a wire size of a metallic conductor line ] in order to make electric resistance small is desirable, since weaving if not much thick becomes difficult and the whole circuit also becomes large, as a size, the range of 0.01mm - 5mm is desirable for a diameter.

[0010] Moreover, resin, such as polyurethane, polyethylene, polypropylene, a formal, and ethylene tetrafluoride, is [ that what is necessary is just the quality of the material which has the flexibility which can be woven in the shape of a mesh by turns at least as a pre-insulation ingredient ] usable.

[0011] The weave of mesh-like solid wiring of this invention can change weave by the helicopter loading site of the electrical part on a plain weave, twill, and other circuits, and can also form mesh-like solid wiring. And in case they may differ even if the metallic conductor line used as warp and the weft has the same wire size, and they are woven further, even if it is a metallic conductor line about one side and is in any of whether another side is made into a pre-insulation metallic conductor line, or to make both into a pre-insulation metallic conductor line, it does not interfere.

[0012] next, since the plain-weave mesh-like solid wiring 2 used for this invention is supple, the insulating agent 3 is sunk into a clearance as reinforcement -- you may make -- moreover, an electrical part and a conductor, when generation of heat from a circuit becomes a problem the resin which filled up the clearance between mesh-like solid wiring with the thermally conductive good filler as an insulating agent 3 is slushed, and it solidifies -- making -- existing filler restoration resin -- an electrical-part metallurgy group -- a conductor -- heat dissipation from a line circuit can be performed efficiently.

[0013] As resin used as an insulating agent 3, if engineer plastics thermoplastics, such as liquefied thermosetting resin, such as an epoxy resin and phenol resin, imide resin, and silicone resin, is used and it is a thermally conductive good object as a filler, there is especially no limit and impalpable powder, such as an aluminum oxide (alumina), aluminum nitride, boron nitride, silicon nitride, oxidation silicon, and cordierite, is used.

[0014] An electrical part can be attached at the easy process of applying for example, a pewter paste to the part of the metallic conductor line which this invention exposed in respect of the side which carries an electrical part, carrying an electrical part in it, and performing a pewter reflow. In order to raise pewter adhesion at this time, nickel plating, gold plate, etc. may be processed for the corrosion prevention of a metallic conductor line. As a bonding pad 8 prepared in wiring 5 further, for example, gold plate, coppering, and nickel plating are used.

[0015] Next, (1) - (3) of drawing 3 is the matrix circuit board for connection of this invention with components, and expresses the side-face sectional view which stuck on the back up plate 13, carried the LED bare chip 6 in wiring 4 or wiring 5, connected after fixing mesh-like solid wiring by the insulating agent 3 and using it as the circuit board 16, and connected the contact pin 14 and the leadframe 15 to wiring 4 and wiring 5 as a connection terminal further.

[0016] In more detail, (1) of drawing 3 carries the LED bare chip 6 in one field of the matrix circuit board, it connects with wiring 4, and connects wiring 5 with the LED bare chip 6 with a wire 7 through a bonding pad 8, and a contact pin 14 connects it with wiring 4 and wiring 5 in respect of another side by the through tube prepared in the back up plate 13. And the connection between wiring 4 and wiring 5, and a contact pin 14 does not interfere, even if it connects through the conductive through hole (not shown) established in the back up plate 13.

[0017] Moreover, (2) of drawing 3 carries the LED bare chip 6 in one field of the matrix circuit board, it connects with wiring 4, and connects wiring 5 with the LED bare chip 6 with a wire 7 through a bonding pad 8, and a leadframe 15 connects it with wiring 4 and wiring 5 in respect of another side.

[0018] And it carries the LED bare chip 6 in the matrix circuit board, and (3) of drawing 3 connects with wiring 5, it connects wiring 4 with the LED bare chip 6 with a wire 7 through a bonding pad 8, and further, in respect of the same, a leadframe 15 connects with wiring 4 and wiring 5, and it carries the LED bare chip 6 in a leadframe 15.

[0019] Thus, as a connection terminal linked to the wiring 4 of the matrix circuit board, and wiring 5, although there are a contact pin 14 and a leadframe 15, a flexible substrate can be used as a connection fixture. And a connection terminal and a connection fixture are used in order to connect with the connection with the mother board for making electrical parts, such as connection with the mother board for making LED carried in (1) same circuit board drive, diodes other than LED carried in (2) same circuit board, a lamp, and a resistance element, drive, and the matrix circuit board besides (3).

[0020] Although used as reinforcement of the matrix circuit board if needed, in case aluminum, silicon steel, carbon steel, SUS, Invar, etc. are used in case heat-conduction effectiveness is gathered as the quality of the material of the back up

plate 13, and the back up plate 13 seldom needs thermal conductivity, it does not interfere with resin plates, such as phenol resin, imide resin, and an epoxy resin,, either.

[0021] The matrix circuit board of this invention is producible by grinding the insulating material of the metallic conductor line by which the location of a request of one side or both sides which are exposed when it sees at the flat surface of a plain weave or mesh-like solid wiring which carried out twill is not insulated, and a pre-insulation metallic conductor line, and exposing a metallic conductor line. Moreover, a metallic conductor line can produce both by grinding the insulating material of a desired location and exposing a metallic conductor line, when covered with the insulating material.

[0022] And this circuit board can be reinforced by infiltrating the insulating agent of a resin-like object into the clearance between mesh-like solid wiring as occasion demands.

[0023] thus, the thing which this invention can manufacture the matrix circuit board easily by using various mesh-like solid wiring, moreover becomes stable [ the supply voltage to a metallic conductor line or an electrical part ], and is sunk [ clearance / between mesh-like solid wiring ] in an insulating agent with good thermal conductivity -- an electrical-part metallurgy group -- a conductor -- the heat dissipation nature from a line circuit also becomes good.

[0024] Furthermore, by connecting a pin, a leadframe, a flexible substrate, etc. for connection to a rear face or a front face, it can connect keeping constant LED dot pitch spacing after connecting connection with the mother board for making LED drive, and connection with other matrix circuit boards, and the matrix circuit board can produce the very reliable matrix circuit board easily. What is necessary is just to attach housing etc. if needed, when using this matrix circuit board as a LED display furthermore.

[0025] As operation using these descriptions of the matrix circuit board of this invention, it can be used as the circuit board for LED displays, or other functional parts.

[0026] Furthermore, an example explains this invention concretely.

example 1 polyurethane resin -- copper wire with a diameter of 0.5mm -- covering -- the pre-insulation metallic conductor line 1 -- making -- this conductor -- it put on the copper plate with a thickness of 0.3mm which wove the line 1 in the shape of a mesh at intervals of 2mm, considered as the plain-weave mesh-like solid wiring 2, and applied the release agent by making this into a mold release plate. Next, the liquefied epoxy resin (the product made from oil-ized Shell: a trade name, Epicoat 807) filled up with the alumina impalpable powder of 50 capacity % as an insulating agent 3 was slushed and stiffened to extent which the solid wiring intersection section front face of the pre-insulation metallic conductor line 1 exposes, and the substrate was produced. This substrate removed the mold release plate, after an epoxy resin's hardening, it ground it until copper wire exposed with abrasives the pre-insulation metallic conductor line 1 exposed to both sides, and it obtained the matrix circuit board. The matrix circuit board connected the LED bare chip 6 bottom to wiring 4 by soldering at the required part of one field of the exposed copper wire, and connected the bottom to wiring 5 by wire bonding. It was made for the dimension from the end face of the circuit board to LED bare chip 6 connection of the outermost periphery to become half [ of the dot pitch of this chip 6 ] at this time. Furthermore, in order to connect with the mother board for an LED drive, open a larger hole than the diameter of a contact pin 14 in the field of another side by making an aluminum plate into the back up plate 13, and an epoxy resin is slushed into an insulation. Open a hole with a still more nearly same diameter [ as a contact pin 14 ] of 0.5mm, and this hole is made to arrange the contact pin 14 whose tip is 0.7mm for the diameter of 0.5mm. The metal outcrop which is not connected with a contact pin 14 so that electrical connection with the matrix circuit board can be performed A HANDAPE-strike is applied to the part which applies an insulating agent and connects with the contact pin 14 of an exposure metallic conductor. After carrying out alignment to the aluminum substrate which arranged the contact pin 14 and piling up, a pewter reflow was carried out, wiring 4 and wiring 5 of a contact pin 14 and the matrix circuit board were connected electrically, and the module for an LED display was produced.

[0027] Except having used without covering one copper wire of the example 2 plain-weave mesh-like solid wiring 2, the same actuation as an example 1 was performed, and the module for an LED display was produced.

[0028] Except having considered as the hole of the same diameter as a contact pin 14 at once, the hole in the case of attaching a contact pin 14 in this substrate, using a glass epoxy resin substrate as the example 3 back up plate 13 performed the same actuation as an example 1, and produced the module for an LED display.

[0029] example 4 polyurethane resin -- copper wire with a diameter of 0.5mm -- covering -- the pre-insulation metallic conductor line 1 -- making -- this conductor -- it put on the copper plate with a thickness of 0.3mm which wove the line 1 in the shape of a mesh at intervals of 2mm, considered as the plain-weave mesh-like solid wiring 2, and applied the release agent by making this into a mold release plate. Next, the liquefied epoxy resin (the product made from oil-ized Shell: a trade name, Epicoat 807) filled up with the alumina impalpable powder of 50 capacity % as an insulating agent 3 was slushed and stiffened to extent which the solid wiring intersection section front face of the pre-insulation metallic conductor line 1 exposes, and the substrate was produced. This substrate removed the mold release plate, after an epoxy resin's hardening, it ground it until copper wire exposed with abrasives the pre-insulation metallic conductor line 1 exposed to both sides, and it obtained the matrix circuit board. The matrix circuit board connected the LED bare chip 6 bottom to wiring 4 by soldering at the required part of one field of the exposed copper wire, and connected the bottom to wiring 5 by wire bonding. It was made for the dimension from the end face of a substrate to LED bare chip 6 connection of the outermost periphery to become half [ of the dot pitch of this chip 6 ] at this time. Furthermore, in the field of another side, it produces so that a leadframe 15 can be beforehand connected from the four directions of the matrix circuit board by 0.5mm of 4mm pitches, in order to connect with the mother board for an LED drive. The metal outcrop which does not connect this with the leadframe 15 on the rear face of the matrix circuit board applied the HANDAPE-strike to the part

which applies an insulating agent and connects with the leadframe 15 of an exposure metallic conductor, and after it carried out alignment of this leadframe 15, it connected it by the pewter reflow. Moreover, in order to raise reinforcement and heat dissipation nature, the 1.5mm aluminum plate was pasted up on the part to which the leadframe 15 of the rear face of the matrix circuit board is not connected with the epoxy resin as the back up plate 13, and the module for an LED display was obtained.

[0030] In example 5 example 4, the leadframe 15 obtained the module for an LED display like the example 5 except having connected with the periphery of the same field as the LED bare chip 6 of the matrix circuit board, and having carried the LED bare chip 6 also in this leadframe 15.

[0031] In example 6 example 4, the leadframe 15 obtained the functional part which can be used for printing to a thermal paper like an example 5 except having connected with the periphery of the same field as the resistance element of the matrix circuit board, and having carried the resistance element also in this leadframe 15.

[0032]

[Effect of the Invention] Electric resistance can make it smaller than the copper foil circuit usually used by being able to make it easily as above, even if the matrix circuit board by this invention does not prepare a through hole etc., and heat dissipation nature of this circuit board improving by sinking in thermal conductor filler content resin moreover, and enlarging the diameter of the copper wire which is a metallic conductor line. The functional part which it is cheap and the variation in brightness is [ a functional part ] small, heat dissipation nature is moreover good, and the module for an LED display which does not have a boundary line in the dot pitch between the circuit boards is obtained [ furthermore this invention has the predominance which there is no boundary line in an LED dot space and can be connected also between circuit board connection by attaching the components for connection with a mother board or the other matrices circuit board, ] as the matrix circuit board for LED display boards, in addition can be used for printing can be obtained.

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**CLAIMS**

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**[Claim(s)]**

[Claim 1] The matrix circuit board for connection with components which carries out mutual mesh-like solid wiring at least where a metallic conductor line is insulated beforehand, removes a desired insulating part, carries an electrical part in one field of the matrix circuit board to which it makes it come to expose a metallic conductor line, connects with said metallic conductor line, prepares what was further chosen as the field of another side from the group of a contact pin, a leadframe, and a flexible substrate, and comes to connect with said metallic conductor line.

[Claim 2] The matrix circuit board for connection with components which carries out mutual mesh-like solid wiring at least where a metallic conductor line is insulated beforehand, removes a desired insulating part, carries an electrical part in the matrix circuit board to which it makes it come to expose a metallic conductor line, connects with said metallic conductor line, forms the leadframe or flexible substrate which may carry an electrical part in the same field further, and comes to connect with said metallic conductor line.

[Claim 3] The matrix circuit board for connection according to claim 1 or 2 with components whose electrical part is light emitting diode [claim 4] The matrix circuit board for connection according to claim 1, 2, or 3 with components which makes an insulating agent come to sink into the clearance between mutual mesh-like solid wiring.

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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] (1) of drawing 1 is the perspective view of plain-weave mesh-like solid wiring which wove the pre-insulation metallic conductor line by turns, and (2) is a top view showing wiring which consists of each of the pre-insulation metallic conductor line exposed when plain-weave mesh-like solid wiring is seen at a flat surface.

[Drawing 2] Drawing 2 expresses the side-face sectional view of the plotting board which pasted up the monochrome luminescence LED bare chip on wiring to mesh-like solid wiring.

[Drawing 3] Drawing 3 is the side-face sectional view having shown the installation condition of the components for connection for carrying an electrical part in the front face of the matrix circuit board, and connecting with the mother board for an electrical-part drive, or other matrix circuit boards at the rear face. What (1) opened the hole in the back up plate, and connected the contact pin to the rear face of the matrix circuit board electrically, (2) connects a leadframe to the rear face of the matrix circuit board, and (3) is the side-face sectional view of the module for an LED display which connected the leadframe to the front face of the matrix circuit board.

[Drawing 4] Drawing 4 is a side-face sectional view showing the conventional plotting board.

[Description of Notations]

- 1 Pre-insulation Metallic Conductor Line
- 2 Plain-Weave Mesh-like Solid Wiring
- 3 Insulating Agent
- 4 Wiring
- 5 Wiring
- 6 LED Bare Chip
- 7 Wire
- 8 Bonding Pad
- 9 Surface Electrode
- 10 Surface Current Carrying Part
- 11 Through Hole
- 12 Insulating Substrate
- 13 Back Up Plate
- 14 Contact Pin
- 15 Leadframe
- 16 Circuit Board

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[Translation done.]

DERWENT-ACC-NO: **1993-138392**

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TITLE: **Matrix circuit board** with connecting part - uses  
exposed

portion of reticulate 3=D circuit structure with  
insulator coat as conductor-wire circuit, to connect  
device to mother board or another circuit board

without

using through-hole or 3=D printed circuit NoAbstract

PATENT-ASSIGNEE: DENKI KAGAKU KOGYO KK[ELED]

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ABSTRACTED-PUB-NO: JP 05074975A

EQUIVALENT-ABSTRACTS:

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TITLE-TERMS: **MATRIX CIRCUIT BOARD** CONNECT PART EXPOSE

PORTION RETICULATED

CIRCUIT STRUCTURE INSULATE COAT CONDUCTOR WIRE  
CIRCUIT CONNECT

DEVICE MOTHER BOARD CIRCUIT BOARD THROUGH HOLE  
PRINT CIRCUIT

NOABSTRACT

DERWENT-CLASS: P85 U12

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TITLE: MATRIX CIRCUIT SUBSTRATE WITH CONNECTING  
COMPONENT

PUBN-DATE: March 26, 1993

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**ABSTRACT:**

**PURPOSE:** To obtain improved heat efficiency by forming a flat mesh type three- dimensional wirings by alternately weaving the vertical and lateral

threads of metal conductive lead covered with insulator.

CONSTITUTION: A circuit substrate 1 is formed by impregnating the gaps between plain-woven mesh type three-dimensional wiring 2 with an insulating agent 3 and the insulating part for mounting electric components such as an LED, diode, lamp and resistance elements, etc., to the wirings 4, 5 exposed on the surface is ground to expose a metal conductive lead 1 in the plan view of the insulator-covered metal conductive lead 1 wired in a three-dimensional manner like a mesh. A monochromatic light emitting diode bare chip 6 is connected to the wire 4 via the solder and is coupled with a bonding pad 8 and a wire 7 provided for the wiring. Thereby, electric components and a circuit

of metal conductive wire 1 insure effective heat radiation.

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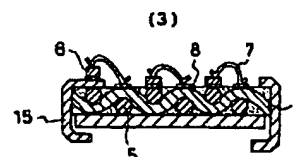
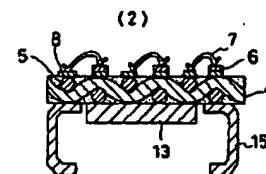
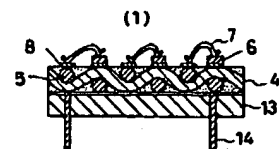
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(54)【発明の名称】 接続用部品付きマトリックス回路基板

## (57)【要約】

【目的】 マトリックス回路基板でスルーホールや立体印刷回路を用いなくて、しかもマザーボード及び他の回路基板と容易に接続可能な回路基板とする。

【構成】 樹脂状絶縁物で被覆された網目状立体配線の一部を露出させて導体線回路として発光ダイオード、ランプ及び抵抗素子等の電気部品を搭載し、さらに露出された残りの導体線回路を使用して接続ピン及びリードフレームなどを接続する。



1

## 【特許請求の範囲】

【請求項1】金属導体線を予め絶縁された状態で少なくとも交互網目状立体配線して所望の絶縁部分を除去して金属導体線を露出させてなるマトリックス回路基板の一方の面に電気部品を搭載して前記金属導体線と接続し、さらに他方の面に接続ピン、リードフレーム及びフレキシブル基板の群から選ばれたものを設けて前記金属導体線と接続してなる接続用部品付きマトリックス回路基板。

【請求項2】金属導体線を予め絶縁された状態で少なくとも交互網目状立体配線して所望の絶縁部分を除去して金属導体線を露出させてなるマトリックス回路基板に電気部品を搭載して前記金属導体線と接続し、さらに同一面に電気部品を搭載しうるリードフレーム又はフレキシブル基板を設けて前記金属導体線と接続してなる接続用部品付きマトリックス回路基板。

【請求項3】電気部品が発光ダイオードである請求項1又は2記載の接続用部品付きマトリックス回路基板

【請求項4】交互網目状立体配線の隙間に絶縁剤を含浸させてなる請求項1、2又は3記載の接続用部品付きマトリックス回路基板。

## 【発明の詳細な説明】

【0001】

【産業上の利用分野】本発明は、交互網目状立体配線されたマトリックス回路基板上に発光ダイオード（以下LEDという）、ランプ及び抵抗素子などの電気部品を搭載するための回路基板、例えばLED表示用モジュールに使用される接続用部品付きマトリックス回路基板に関する。

【0002】

【従来の技術】この種のマトリックス回路基板においては、図4に示すとおり絶縁基板12の表と裏の両面にアノードまたはカソード側配線4（以下配線4という）とカソードまたはアノード側配線5（以下配線5という）からなる電極パターンを形成し、絶縁基板12の裏面側に形成された配線4をスルーホール11を介して絶縁基板12の表面側で配線5とした電極の表面電極9とは分離して形成した表面導電部10に接続し、このようにして形成した表面電極9と表面導電部10とにダイオード及び抵抗素子等の電気部品、例えばLEDベアチップ6を接続することにより回路を形成している。

【0003】

【発明が解決しようとする課題】しかし、この種のマトリックス回路の構成方法では、平面上での導電部となる配線が交差するために、スルーホールを用いるかジャンパーチップあるいは印刷導体による立体配線を行う必要がある。工程が複雑になるばかりか接続の信頼性等に問題があった。また回路として用いられる導体の厚みとしては通常18 $\mu$ m若しくは35 $\mu$ mなので導体抵抗が大きく、導体としての回路が長くなると電圧降下によ

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り供給電圧に勾配が生じ、その結果発光ダイオードにおいては輝度に差が出るなどの問題が起こり易くなる。

【0004】さらにスルーホール用回路基板としては、絶縁材料として主に熱伝導性が悪いガラス繊維含有エポキシ樹脂基板が用いられるので、導体回路や搭載したダイオードや抵抗素子等の電気部品からの発熱が蓄積しやすく回路上で誤動作などが発生する問題点があった。またスルーホールを用いずにLEDを搭載したマトリックス回路基板を作製した場合は、該マトリックス基板を複数枚接続しようとする、接続間の境界でLEDのドットピッチ間隔が大きくなってしまおうという問題点がある。

【0005】

【課題を解決するための手段】本発明は、これらの問題を解決するための方法として種々検討した結果、金属導体線を予め絶縁された状態で種々の網目状に立体配線することにより、少なくとも一方の平面上で回路を形成してこの面にLED、ダイオード、ランプ及び抵抗素子等の電気部品を搭載させることができ、さらに前記例えばLEDを点灯させるためのマザーボードやその他電気部品を駆動させるための回路または他のLED表示用マトリックス回路基板とLEDのドットピッチを変える事なく接続するための接続ピンやリードフレームとしての接続用端子又はその他の接続治具を容易に設けることができることを見出し本発明を完成するに至った。

【0006】すなわち本発明は1. 金属導体線を予め絶縁された状態で少なくとも交互網目状立体配線して所望の絶縁部分を除去して金属導体線を露出させてなるマトリックス回路基板の一方の面に電気部品を搭載して前記金属導体線と接続し、さらに他方の面に接続ピン、リードフレーム及びフレキシブル基板の群から選ばれたものを設けて前記金属導体線と接続してなる接続用部品付きマトリックス回路基板及び2. 金属導体線を予め絶縁された状態で少なくとも交互網目状立体配線して所望の絶縁部分を除去して金属導体線を露出させてなるマトリックス回路基板に電気部品を搭載して前記金属導体線を接続し、さらに同一面に電気部品を搭載しうるリードフレーム又はフレキシブル基板を設けて前記金属導体線と接続してなる接続用部品付きマトリックス回路基板を特徴とするものである。

【0007】

【作用及び実施例】以下図面により本発明を詳細に説明する。図1の(1)は、本発明の絶縁材料で被覆された絶縁被覆金属導体線1を縦糸と横糸として交互に織った平織り網目状立体配線2の斜視図であり、(2)は、平織り網目状立体配線2を平面で見た際に露出される絶縁被覆金属導体線1からなる、図2における配線4と配線5を表わす平面図である。

【0008】また図2は、平織り網目状立体配線2の隙間を絶縁剤3で含浸して回路基板16とし、網目状に立

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体配線された絶縁被覆金属導体線1の平面で見た際に、表面に露出される配線4と配線5に電気部品としてLED、ダイオード、ランプ及び抵抗素子等(以下電気部品という)を搭載する絶縁部分を研磨して金属導体線を露出させ、配線4に半田を介して単色発光ダイオードベアチップ6を接続し、配線5に設けたボンディングパッド8とワイヤー7で結線した表示板の側面断面図である。

【0009】本発明の絶縁被覆金属導体線1に用いる金属導体線としては、電気抵抗の小さい物なら材質として何ら制限はないが、電気抵抗及び価格の点から銅線が適している。そして金属導体線の線径としては特に制限はないが、電気抵抗を小さくするためには太い方が好ましいが、あまり太いと織るのが困難になり、また回路全体も大きくなるので太さとしては直径で0.01mm〜5mmの範囲が好ましい。

【0010】また絶縁被覆材料としては、少なくとも交互に網目状に織ることのできる柔軟性を有する材質であれば良く、ポリウレタン、ポリエチレン、ポリプロピレン、ホルマール及び4フッ化エチレンなどの樹脂が使用可能である。

【0011】本発明の網目状立体配線の織り方は、平織り、綾織り及びその他回路上の電気部品の搭載位置により織り方を変えて網目状立体配線を形成することもできる。そして縦糸と横糸として用いる金属導体線は、線径が同一でも異なってもよく、さらに織る際に一方を金属導体線で、他方を絶縁被覆金属導体線とするか、又は両方を絶縁被覆金属導体線とするかのいずれかであっても差し支えない。

【0012】次に本発明に用いる平織り網目状立体配線2は柔軟性があるため補強として、隙間に絶縁剤3を含浸させてもよく、また電気部品や導体回路からの発熱が問題になる時は、網目状立体配線の隙間に絶縁剤3として熱伝導性のよいフィラーを充填した樹脂を流し込み固化させて、既フィラー充填樹脂により電気部品や金属導体線回路からの放熱を効率よく行うことができる。

【0013】絶縁剤3として用いる樹脂としては、エポキシ樹脂及びフェノール樹脂等の液状熱硬化性樹脂、イミド樹脂及びシリコン樹脂等のエンジニアプラスチック熱可塑性樹脂が用いられ、またフィラーとしては、熱伝導性の良い物なら特に制限はなく、酸化アルミニウム(アルミナ)、窒化アルミニウム、窒化硼素、窒化珪素、酸化珪素及びコーゼライト等の微粉末が用いられる。

【0014】本発明の露出した金属導体線の部分には、電気部品を搭載する側の面では例えばハンダペーストを塗布して電気部品を搭載してハンダリフローを行うという簡単な工程で電気部品の取り付けが行える。この時ハンダ付着性を上げるため又は金属導体線の腐食防止のためにニッケルメッキ及び金メッキなどの処理を行っても良い。さらに例えば配線5に設けるボンディングパッド

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8としては、金メッキ、銅メッキ及びニッケルメッキが使用される。

【0015】次に図3の(1)〜(3)は、本発明の接続用部品付きマトリックス回路基板であり、網目状立体配線を絶縁剤3で固定化して回路基板16とした後に補強板13に貼着してLEDベアチップ6を配線4又は配線5に搭載して接続し、さらに配線4及び配線5に接続端子として接続ピン14及びリードフレーム15を接続した側面断面図を表わすものである。

【0016】さらに詳しくは図3の(1)は、マトリックス回路基板の一方の面にLEDベアチップ6を搭載して配線4と接続してボンディングパッド8を介してワイヤー7でLEDベアチップ6と配線5を接続し、他方の面では、補強板13に設けられた貫通孔によって配線4及び配線5と接続ピン14が接続したものである。そして配線4及び配線5と接続ピン14との接続は、補強板13に設けられた導電性スルーホール(図示せず)を介して接続されるものであっても差し支えない。

【0017】また図3の(2)は、マトリックス回路基板の一方の面にLEDベアチップ6を搭載して配線4と接続してボンディングパッド8を介してワイヤー7でLEDベアチップ6と配線5を接続し、他方の面では、配線4及び配線5とリードフレーム15が接続したものである。

【0018】そして図3の(3)は、マトリックス回路基板にLEDベアチップ6を搭載して配線5と接続してボンディングパッド8を介してワイヤー7でLEDベアチップ6と配線4を接続し、さらに同一面でリードフレーム15が配線4及び配線5と接続してリードフレーム15にはLEDベアチップ6を搭載したものである。

【0019】このようにマトリックス回路基板の配線4及び配線5と接続した接続端子としては、接続ピン14及びリードフレーム15があるが、その他接続治具としてはフレキシブル基板が使用できる。そして接続端子及び接続治具は、(1)同一回路基板に搭載されたLEDを駆動させるためのマザーボードへの接続、(2)同一回路基板に搭載されたLED以外のダイオード、ランプ及び抵抗素子等の電気部品を駆動させるためのマザーボードへの接続及び(3)他のマトリックス回路基板と接続するために使用するものである。

【0020】補強板13は、必要に応じてマトリックス回路基板の補強として使用されるが、補強板13の材質として熱伝導効率をあげる際には、例えばアルミニウム、珪素鋼、炭素鋼、SUS及びインバー等が用いられ、また熱伝導性をあまり必要としない際にはフェノール樹脂、イミド樹脂及びエポキシ樹脂等の樹脂板でも差し支えない。

【0021】本発明のマトリックス回路基板は、例えば平織り又は綾織りした網目状立体配線の平面で見た際に露出する、片面又は両面の所望の位置の絶縁されてい



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い金属導体線及び絶縁被覆金属導体線の絶縁材料を研磨して金属導体線を露出させることにより作製することができる。また金属導体線が両方とも絶縁材料で被覆されている際は、所望の位置の絶縁材料を研磨して金属導体線を露出させることにより作製することができる。

【0022】そしてこの回路基板は、必要により網目状立体的配線の隙間に樹脂状物の絶縁剤を含浸させることにより補強できる。

【0023】このように本発明は、種々の網目状立体的配線を用いることによりマトリックス回路基板の製造が簡単に行え、しかも金属導体線や電気部品への供給電圧が安定となり、網目状立体的配線の隙間を熱伝導性良好な絶縁剤を含浸することにより電気部品や金属導体線回路からの放熱性もよくなる。

【0024】さらにマトリックス回路基板は、裏面または表面に接続用のピン、リードフレーム及びフレキシブル基板等を接続することで、例えばLEDを駆動させるためのマザーボードへの接続や他のマトリックス回路基板との接続を接続後のLEDドットピッチ間隔を一定に保ったまま接続でき、極めて信頼性の高いマトリックス回路基板の作製を容易に行うことができる。さらにこのマトリックス回路基板をLEDディスプレイとして使用する場合は必要に応じてハウジング等を取り付けなければならない。

【0025】これらの特徴を利用した本発明のマトリックス回路基板の使用方法としては、LEDディスプレイ用の回路基板やその他の機能部品として使用することができる。

【0026】さらに実施例により本発明を具体的に説明する。

#### 実施例1

ポリウレタン樹脂で直径0.5mmの銅線を被覆して絶縁被覆金属導体線1を作り、この導体線1を2mm間隔で網目状に織って平織り網目状立体的配線2とし、これを離型板として離型剤を塗布した厚み0.3mmの銅板にのせた。次に絶縁剤3として50容量%のアルミナ微粉末を充填した液状エポキシ樹脂（油化シェル（株）製：商品名、エピコート807）を絶縁被覆金属導体線1の立体的配線交点部表面が露出する程度まで流し込み硬化させて基板を作製した。この基板はエポキシ樹脂が硬化後に離型板を剥し、両面に露出している絶縁被覆金属導体線1を研磨材で銅線が露出するまで研磨してマトリックス回路基板を得た。マトリックス回路基板は、露出した銅線の一方の面の必要な部分にLEDベアチップ6の下側を半田付けにより配線4に接続して上側をワイヤーボンディングにより配線5に接続した。この時、回路基板の端面から最外周のLEDベアチップ6接続部までの寸法は、該チップ6のドットピッチの半分になるようにした。さらに他方の面には、LED駆動用のマザーボードと接続するためアルミニウム板を補強板13として接続

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ピン14の直径よりも大きい孔をあけて絶縁用にエポキシ樹脂を流し込み、さらに接続ピン14と同じ直径0.5mmの孔をあけて直径0.5mmで先端が0.7mmの接続ピン14をこの孔に配列させ、マトリックス回路基板との電気接続を行えるように接続ピン14と接続しない金属露出部は、絶縁剤を塗布して露出金属導体の接続ピン14と接続する部分にハンダペーストを塗布し、接続ピン14を配列したアルミニウム基板と位置合わせして重ねた後にハンダリフローして接続ピン14とマトリックス回路基板の配線4及び配線5とを電氣的に接続してLED表示用モジュールを作製した。

#### 【0027】実施例2

平織り網目状立体的配線2の一方の銅線を被覆しないで用いた以外は、実施例1と同様な操作を行いLED表示用モジュールを作製した。

#### 【0028】実施例3

補強板13としてガラスエポキシ樹脂基板を用いて該基板に接続ピン14を取り付ける場合の孔は1回で接続ピン14と同じ直径の孔とした以外は、実施例1と同様な操作を行いLED表示用モジュールを作製した。

#### 【0029】実施例4

ポリウレタン樹脂で直径0.5mmの銅線を被覆して絶縁被覆金属導体線1を作り、この導体線1を2mm間隔で網目状に織って平織り網目状立体的配線2とし、これを離型板として離型剤を塗布した厚み0.3mmの銅板にのせた。次に絶縁剤3として50容量%のアルミナ微粉末を充填した液状エポキシ樹脂（油化シェル（株）製：商品名、エピコート807）を絶縁被覆金属導体線1の立体的配線交点部表面が露出する程度まで流し込み硬化させて基板を作製した。この基板はエポキシ樹脂が硬化後に離型板を剥し、両面に露出している絶縁被覆金属導体線1を研磨材で銅線が露出するまで研磨してマトリックス回路基板を得た。マトリックス回路基板は、露出した銅線の一方の面の必要な部分にLEDベアチップ6の下側を半田付けにより配線4に接続し上側をワイヤーボンディングにより配線5に接続した。この時、基板の端面から最外周のLEDベアチップ6接続部までの寸法は、該チップ6のドットピッチの半分になるようにした。さらに他方の面には、LED駆動用のマザーボードと接続するためにリードフレーム15を予め4mmピッチ幅0.5mmでマトリックス回路基板の4方向から接続できるように作製しておき、これをマトリックス回路基板裏面のリードフレーム15と接続しない金属露出部は、絶縁剤を塗布して露出金属導体のリードフレーム15と接続する部分にハンダペーストを塗布し、該リードフレーム15を位置合わせした後にハンダリフローにより接続した。またマトリックス回路基板の裏面のリードフレーム15が接続されていない部分には、補強と放熱性を上げるために補強板13として1.5mmのアルミニウム板をエポキシ樹脂により接着し、LED表示用モジュ

ールを得た。

#### 【0030】実施例5

実施例4においてリードフレーム15は、マトリックス回路基板のLEDベアチップ6と同じ面の外周に接続して該リードフレーム15にもLEDベアチップ6を搭載した以外は、実施例5と同様にしてLED表示用モジュールを得た。

#### 【0031】実施例6

実施例4においてリードフレーム15は、マトリックス回路基板の抵抗素子と同じ面の外周に接続して該リードフレーム15にも抵抗素子を搭載した以外は、実施例5と同様にして感熱紙への印字用に使用できる機能部品を得た。

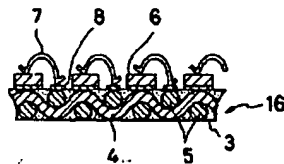
#### 【0032】

【発明の効果】以上のとおり本発明によるマトリックス回路基板は、スルーホール等を設けなくても容易に作ることができ、しかも該回路基板は熱良導体フィラー含有樹脂を含浸することで放熱性が向上し、また金属導体線である銅線の直径を大きくすることで通常用いられる銅箔回路よりも電気抵抗が小さくすることができる。さらに本発明は、マザーボードや他マトリックス回路基板との接続用部品を取り付けることで回路基板接続間でもLEDドット間隔に境目がなく接続できる優位性があり、LED表示板用のマトリックス回路基板として、安価で輝度のバラツキが小さく、しかも放熱性が良好で回路基板間のドットピッチに境目が無いLED表示用モジュールが得られ、その他印字用等に使用できる機能部品を得ることができる。

#### 【図面の簡単な説明】

【図1】図1の(1)は、絶縁被覆金属導体線を交互に織った平織り網目状立体配線の斜視図であり、(2)は、平織り網目状立体配線を平面で見た際に露出される絶縁被覆金属導体線の各々からなる配線を表わす平面図

【図2】



である。

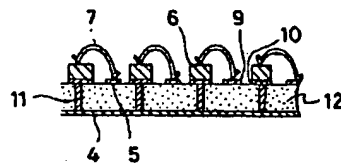
【図2】図2は、網目状立体配線に単色発光LEDベアチップを配線に接着した表示板の側面断面図を表わすものである。

【図3】図3は、マトリックス回路基板の表面に電気部品を搭載して裏面に電気部品駆動用のマザーボードまたは他のマトリックス回路基板と接続するための接続用部品の取り付け状態を示した側面断面図で、(1)は補強板に孔をあけてマトリックス回路基板の裏面に接続ピンを電気的に接続したもの、(2)はリードフレームをマトリックス回路基板の裏面に接続したものであり、また(3)はマトリックス回路基板の表面にリードフレームを接続したLED表示用モジュールの側面断面図である

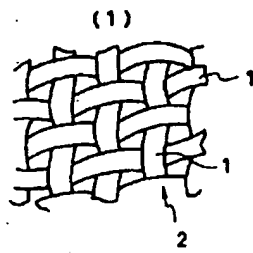
#### 【符号の説明】

- 1 絶縁被覆金属導体線
- 2 平織り網目状立体配線
- 3 絶縁剤
- 4 配線
- 5 配線
- 6 LEDベアチップ
- 7 ワイヤ
- 8 ボンディングパッド
- 9 表面電極
- 10 表面導電部
- 11 スルーホール
- 12 絶縁基板
- 13 補強板
- 14 接続ピン
- 15 リードフレーム
- 16 回路基板

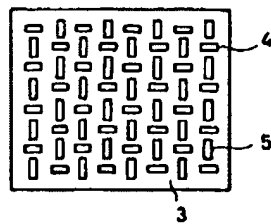
【図4】



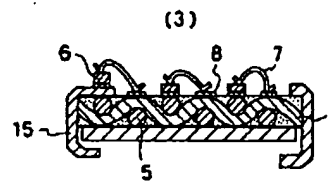
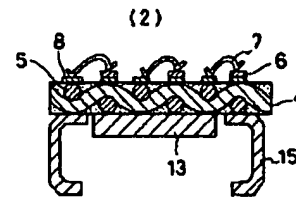
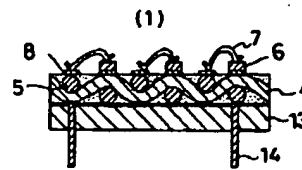
【図1】



(2)



【図3】



フロントページの続き

(51)Int. Cl.<sup>5</sup>

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